Metabolic syndrome in renal transplant recipients in Duhok Kidney Diseases Center

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A B S T R A C T

Introduction: Renal transplant subjects are considered at risk for the development of obesity and changes in lipid and glucose metabolism because of the use of immunosuppressive medications. This study was aimed at assessing the prevalence of metabolic syndrome in renal transplant recipients and to identify factors associated with its occurrence.
Materials and methods: A cross-sectional study was conducted recruiting renal transplant patients. The metabolic syndrome (MS) was diagnosed according to the criteria of the 2004 revision of ATP III criteria.
Results: MS was found in 43/132 (32.5%) of participants. Also, it was found in 18/70 (25.7%) of males, which was significantly lesser than that found in female 25/62 (40.3%) ($p < 0.05$). hypertension is the commonest criteria of MS as it was found in 31/43 (72%) of the recruited sample.
Conclusions: MS is common in the recruited sample here in Iraq. Preventive measures should be taken to prevent such an issue and its related complications.

1. Introduction

Metabolic syndrome (MS) consists of a cluster of certain clinical traits with metabolic and hemodynamic alterations. This includes abdominal obesity, high blood pressure, insulin resistance (IR), and dyslipidemia, which individually or in combination increase the risk for developing overt diabetes [1], cardiovascular disease (CVD) [2], chronic kidney disease (CKD) [3,4] and cardiovascular mortality [5]. MS affects 44% of the united states population older than 50 years old and it is more prevalent in female than male. The age dependency of the syndrome's prevalence is seen in most populations around the world [6]. Risk factors for MS include abdominal obesity, IR, physical inactivity, aging, and hormonal imbalance. A diet rich in saturated fat and cholesterol can predispose to the developing CVD in people with the MS [7].

MS is continuously increasing in the general population, however, its prevalence and consequences in subjects with renal transplantation is not well established [8]. Cardiovascular diseases are the primary cause of morbidity and death in solid organ transplant recipients. Risk factors that contribute to the higher cardiovascular risk in the transplant population include hypertension and dyslipidemia that may be pre-existent to and become more severe after transplantation. Additionally, overweight, obesity and post-transplant diabetes mellitus, which may appear as a consequence of immunosuppression, play a role.

Immunosuppressant and corticosteroids may aggravate hypertension and lipid abnormality and may predispose to new-onset diabetes after transplantation. In addition, weight increase is almost a consistent after transplant [9]. The MS is associated with graft dysfunction and decreased survival among renal transplant recipients [8,10–15].

The aim of this study was to assess the prevalence of metabolic syndrome in renal transplant recipients and to identify factors associated with its occurrence.

2. Methods

This cross sectional study was conducted in Duhok Kidney Disease Center starting from 1st April, 2013 to 30th April, 2015. Participants were randomly select with history of more than one year of live-donor kidney transplantation. Immunosuppressive regimen comprised induction with Basiliximab, followed by maintenance therapy with calcineurin inhibitor (tacrolimus or cyclosporine), mycophenolate mofetil and prednisolone.

Personal health data including past medical history, family history of chronic illnesses, drugs history and immunosuppressive protocol were also collected.

Blood pressure was assessed as the average of two measurements taken after subjects had been seated for at least 5 minutes [16]. Resting systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured by using sphygmomanometer and cuffs appropriate for arm size. The following parameters were

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defined as follows:

- **Hypertension:** was defined as a SBP $\geq$ 140 mmHg and DBP $\geq$ 90 mmHg or use of antihypertensive therapy [17].
- **Waist Circumference:** The WC is measured at the widest part of the abdomen at the end of a relaxed exhalation, cut off value for males $>$ 102 cm, female $>$ 88 cm were considered obese [18].
- **Physical activity**: Scale was constructed by considering the responses to questions on job of participants and how many hours per day of activity, which is divided into active and sedentary activity [19].
- **Metabolic Syndrome:** According to the 2004 revision of ATP III criteria, kidney transplant recipient were classified as having the MS or not. By ATP III criteria, MS is defined as having 3 or more of the followings:

1. WC $>$ 102 cm in men or $>$ 88 cm in women;
2. Triglyceride (TGs) $\geq$ 150 mg/dL or drug treatment for elevated TGs;
3. High density lipoprotein –Cholesterol (HDL-CH) $<$ 40 mg/dL in men or $<$ 50 mg/dL in women or drug treatment for elevated HDL-CH;
4. SBP $\geq$ 130 mm Hg, DBP $\geq$ 85 mm Hg, or use of antihypertensive therapy; and
5. Fasting glucose $\geq$ 100 mg/dL or use of anti-diabetics [20].

3. Ethics

The nature of the study was explained to the participants and oral consent was obtained from all of them. The study protocol was approved by Research committee of School of Medicine-Faculty of Medical Sciences-Duhok University.

4. Statistics

All the data analysis was performed using Excel 2010. Significance of association between various risk factors was assessed using Chi-square and student T tests and the level of statistical significance was set at $<$ 0.05.

5. Results

5.1. Patients' characteristics

We investigated 132 renal transplant recipients at a median time of 2.1 (1–3.6) years post-transplant. Among these, 72 subjects were males and 60 were females. The mean age of the participant was 36 years (Table 1).

5.2. Determinants of MS

In this study and according to the revised ATP III criteria, it was found that 43/132 (32.5%) of participants had MS (Table 2). Also, it was found that the highest MS rate was found in subjects older than 50 years old (Table 3). We then stratified our data according to gender. MS was found in 18/70 (25.7%) of the male which was significantly lesser than that found in female 25/62 (40.3%) ($p < 0.05$). Central obesity was more prevalent in 38/62 (61.2%) females than that found in males 18/70 (25.7%) ($p < 0.001$) (Table 4). Additionally, high TG levels were higher in female than male ($p < 0.05$) (Table 4).

Table 1
Participants characteristics.

Variable	MS (n=43)	Non-MS (n=89)	P value
Age of recipient (year)	36 ± 14	34 ± 15	0.45
Male (%)	21 (48)	49 (55)	0.25
Female (%)	22 (51)	40(45)	0.25
Mean duration of hemodialysis (year)	1.1	1.3	< 0.05
Waist circumference ($M > 102$ cm, $F > 88$ cm) (%)	27 (63)	29(33)	< 0.001
Obese (%)	15(35)	10(11)	< 0.001
Hypertension (%)	31 (72)	29 (32)	< 0.001
Hypertriglyceridemia (%)	27 (62)	19(21)	< 0.001
Low HDL-CH (%)	22 (51)	23(26)	< 0.05
Regular exercise (%)	7(16)	22(25)	0.13
eGFR (mL/min/1.73 m^2) (%)	71 ± 4.3	81 ± 5.2	< 0.001

Table 2
Patient with different Criteria of MS.

ATP Criteria	No. (%)
0	30 (22.7%)
1	34 (25.7%)
2	25 (18.9%)
3	24 (18.18%)
4	13 (9.8%)
5	6 (4.5%)

Table 3
distribution of MS and non-MS according to age group.

Age (Year)	Total no.	MS (%)	Non-MS (%)
< 30	30	7 (23%)	23 (77%)
30–39	43	13 (30%)	30 (70%)
40–49	41	14(34%)	27 (66%)
≥ 50	18	9 (50%)	9(50%)
Total	**132**	**43**	**89**

Table 4
Crude prevalence of metabolic syndrome and its components as defined by National Cholesterol Education Program–Adult Treatment Panel III criteria.

Component	Crude prevalence (%)			P value
	Total	Men (70)	Women (62)	
Central obesity	56	18	38	< 0.001
Low HDL-cholesterol	45	21	24	0.14
High TG	46	28	17	< 0.05
Hypertension	60	31	27	0.46
Hyperglycaemia	24	11	13	0.057
Metabolic syndrome	43	18	25	< 0.05

Seventeen of the participants had a history of diabetes before renal transplantation and seven new cases were diagnosed post renal transplantation with higher occurrence among Tacrolimus based immunosuppressant group. The data were then stratified according to the immunosuppressant medications. The prevalence of patients with hyperglycaemia was higher in subjects receiving tacrolimus than that receiving cyclosporine ($p < 0.05$). No other significant differences were found (Fig. 1).

6. Discussion

In the general population, the prevalence of MS differs widely among ethnic groups and depending on the definition of MS.